Data: Professional Sports and Mixed Strategies

Game Theory Course:
Jackson, Leyton-Brown & Shoham

Mixed Strategies

- Some counter-intuitive features...

- Do people really play them?

Professional Soccer - Penalty Kicks

- Ignacio Palacios-Heurta (2003) "Professionals Play Minimax" *Review of Economic Studies*, Volume 70, pp 395-415

- 1417 Penalty kicks from FIFA games: Spain, England, Italy...

- Ignacio considers left, center, or right choices, and considered which leg the kicker used; I will keep it down to left and right choices (his page 402) ignoring kicker's leg.

$Kicker/Goalie$	$Left$	$Right$
$Left$	.58, .42	.95, .05
$Right$	.93, .07	.70, .30

Game
Theory
Online

- The Goalie's probability of going Left p_G versus Right $1 - p_G$ must have the kicker indifferent

- The Kicker's probability of going Left p_K versus Right $1 - p_K$ must have the goalie indifferent

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- $p_G.58 + (1 - p_G).95 = .93p_G + .7(1 - p_G)$ or
  $.25(1 - p_G) = .35p_G$ or $p_G = 5/12 = .42$

- The Kicker's probability of going Left p_K versus Right $1 - p_K$ must have the goalie indifferent

- $p_K.42 + (1 - p_K).07 = .05p_K + .3(1 - p_K)$ or
  $.23(1 - p_K) = .37p_K$ or $p_K = 23/60 = .38$

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	Goalie Left	*Goalie Right*	*Kicker Left*	*Kicker Right*
Nash Freq.	.42	.58	.38	.62
Actual Freq.	.42	.58	.40	.60

Game
Theory
Online

- Do players randomize well over time? Pretty well...

- How about under pressure? Do they become predictable?
  Statisticians/Game Theorists starting to keep them honest...

- Other sports: Tennis players and serves, M. Walker and J.
  Woolders, American Economic Review (2001) "Minimax Play
  and Wimbeldon" volume 91, pp 1521-1538.

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- A players must be indifferent between the actions he or she randomizes over

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  - in society and business interactions: audits by tax authorities!